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Notes on the Flora of High Altitudes in Custer County, Colorado.

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During the last few years, while residing in Wet Mountain Valley, I have endeavored, as opportunity permitted, to ascertain something of the flora and fauna of the high altitudes in the Sangre de Cristo Range. The present notes are the results of these investigations, so far as regards the flora of this region. The species enumerated were collected on the eastern slope, in Custer County, and so far as I could guess at the altitudes, (having no aneroid), all are from 10,000 feet above sea level or upwards. These records, which all relate to the plants of the vicinity of Gibb's Peak, (miscalled Gibson Peak on the maps), will give a very fair idea of the general features of the flora, but it is to be remembered that the cryptogamia, grasses, carices, etc., were almost entirely neglected. There is a great opportunity for some future student of these groups in this district.

Most of the species from the Lakes of the Clouds, (11,000 feet or over), were collected by Mrs. M. E. Cusack, and many of the new forms enumerated are in her herbarium. I am greatly indebted to Dr. George Vasey, Dr. J. M. Coulter, Mr. F. W. Anderson, and Mr. J. B. Ellis, for the identification of some of the species.

Ranunculaceæ. About the Lakes of the Clouds are found *Ranunculus abortivus* and *R. pygmæus*, and *Trollius laxus*. In the timber one meets with an abundance of *Aquilegia cærulea*, a plant of great beauty and interest. Near the lakes, (when-

ever in this paper I refer to "the lakes," the Lakes of the Clouds are intended), occurs a f. *pallidiflora*, collected by Mrs. Cusack, with the flowers smaller, white tinged with blue, pods five, and larger leaves. In cultivation, a somewhat similiar variety has been produced, for Vilmorin's catalogue for 1889, p. 114, enumerates a form, "à fleur blanche." It is noticeable that blue flowers most often vary to white.* Near the Micawber Mine there occurs a second variety of *A. cærulea*, which I will call f. *glandulosa*.† It has six pods, and the peduncles and pods are pubescent and viscid-glandular. One head was found with as many as seven pods, but six is the usual number. The remaining Ranunculaceæ occur near the Micawber mine; *Actæa spicata* var. *arguta*, with red berries; and *Delphinium occidentale*, which has also a f. *subroseum*, with the sepals dull bluish-pink, and the plant not so tall.‡

BERBERIDACEÆ. *Berberis repens*, in the Micawber Mine Gulch, is the only representative of the order.

CRUCIFERÆ. *Cardamine cordifolia*, near the Micawber and in Swift Creek Gulch, and *Erysimum asperum*, in the Micawber Mine Gulch, are conspicuous. *E. asperum* presents two forms: of which f. *alpestre*, growing at about 10,000 feet, has the flowers becoming deep orange-brown.‖ At timber line I found the other form —only 61 millimeters high, although the flowers are yellow and of the usual size. Near the Micawber Mine there occurs a puzzling *Sisymbrium*, which I will provisionally call *S. canescens* var. *alpestre*. It is tall, glabrous, stem with a white "bloom;" pods ascending, mostly longer than pedicels. *E. asperum* f. *alpestre*

* I have found this so in my experience, and Mr. F. W. Anderson, who is a close observer, writes me, (December 4th, 1889), as follows: "Yes, undoubtedly blue flowers more often vary to white than do those of any other color. Examples, various common Astragali, Lupins, Delphiniums: Gentians, like the yellows, are more apt to vary to green or greenish."

† There is already a species *A. glandulosa*, in Siberia, but this need not interfere with the use of that name for our present *form*.

‡ *D. scopulorum*, which occurs abundantly at a lower altitude, I did not observe varying in this manner.

‖ This variation occurs as the effect of altitude: lower down, the flowers of this species are yellow. A more extreme form, which I have not seen, has the flowers purple; Miss A. Eastwood found it in the Uncompaghre Cañon. Thus we arrive at the normal colors of some other Cruciferæ.

was found in flower at 10,000 feet, as late as Oct. 9th. *Achillea millefolium*, on Oct. 10th, was the last flower of the year at that high altitude.

CAPPARIDACEÆ. This order has only a place in this list because seeds brought in hay to the Micawber Mine gave rise to a plant or two of *Cleome integrifolia*, a species normally occurring from 8,000 feet downwards.

VIOLACEÆ. *Viola Canadensis*, in the Micawber Mine Gulch.

CARYOPHYLLACEÆ. *Arenaria saxosa* near the lakes; and *Silene acaulis*, at timber line, above Brush Creek, the latter a form with pink flowers on peduncles about 15 millimeters long. *Saponaria Vaccaria*, growing near the Micawber, is merely the result of seeds from hay.

MALVACEÆ. *Sidalcea candida*, near the Micawber.

SAPINDACEÆ. *Acer glabrum*, common near the Micawber.

LEGUMINOSÆ. *Trifolium Parryi* and *T. dasyphyllum*, near the lakes—the latter also near Brush Creek. In the neighborhood of the Micawber we find *Thermopsis montana* and *Astragalus alpinus*, (a form with stipe shorter than calyx); and in Horseshoe Bend Gulch, at barely 10,000 feet, *Lupinus argenteus* occurs on a sunny slope.

ROSACEÆ. Near the lakes, *Potentilla dissecta*, *P. fruticosa*, *Rubus strigosus*, and *Fragaria vesca*—and the last three also near Brush Creek. Above the Micawber Mine occurs a f. *humilis* of *P. fruticosa*, a lower form with about twenty-five stamens: the more ordinary form has about thirty stamens; so this species varies in this matter like the *arguta* section. In the Micawber Mine Gulch are also found *Potentilla gracilis*, *Rosa blanda*, and *Geum macrophyllum*.

SAXIFRAGACEÆ. *Saxifraga nivalis*, *S. bronchialis*, *S. punctata*, and *Ribes lacustre* near the lakes, and the last three also near Brush Creek. *Parnassia fimbriata* occurs near the Micawber.

CRASSULACEÆ. *Sedum rhodanthum*, near the lakes; and above the Micawber *S. stenopetalum*, with a f. *rubrolineatum*, in which the angles of the closed buds are red; when the flower is open the peculiarity is less conspicuous. This is a very interest-

ing variety, showing the tendency to vary to red—red being a normal color in others of the genus.

ONAGRACEÆ. *Epilobium spicatum* is of course abundant. At the Micawber is found *E. coloratum* f. *albiflorum*, with white flowers and glabrous pods. The *Œnotheras*, so conspicuous lower down, are completely absent.

UMBELLIFERÆ. Near the Micawber are *Heracleum lanatum*, *Ligusticum montanum* and *Osmorhiza nuda*. On bare ground at timber line I found a *Peucedanum*, apparently *bicolor*. I submitted it to Dr. Coulter, who remarked that so far as vegetative characters went it agreed with *bicolor*, but since it was gathered too early for fruit, its identity could not be made certain.

CAPRIFOLIACEÆ. *Lonicera involucrata*, *Symphoricarpos oreophilus*, and *Sambucus racemosa*, near the Micawber, and the last also in Swift Creek Gulch. The variation in the color of the fruit of *S. racemosa*, near the Micawber, is very striking. The ordinary form has bright scarlet fruit, but there are two varieties; f. *xanthocarpa*, with cyme rather broader, peduncles deep dark crimson, fruit pale yellow, leaves larger ; and f. *oinocarpa*, with fruit dull crimson. These varieties all grow together, and appear to differ in only the characters given here. According to Wood, *Sambucus "pubens"* has "berries rarely white." Although these elder-berries are so conspicuous, they do not seem to be eaten, not at any rate very largely, by birds.

RUBIACEÆ. *Galium boreale* is abundant near the Micawber Mine.

COMPOSITÆ. *Senecio aureus* var. *croceus*, *S. Fendleri*, *S. werneriæfolius*, *Aster foliaceus* var. *Parryi*, *Cnicus eriocephalus*, *Troximon glaucum*, *Aster Fremonti*, and *Achillea millefolium* occur near the lakes, and the last two near the Micawber Mine. *Cnicus eriocephalus*, a form with bright, chrome yellow corollas, is very conspicuous above the timber line, near Brush Creek. *Aster Fermonti*, near the Micawber, has two forms, *a. pallidus*, rays white, or nearly so, *b. vividus*, rays shorter, more numerous, lilac, with the outer involucral bracts dark, and shorter, radical leaves about 109 millemeters long. *Gymnolomia multiflora* occurs in Horseshoe Bend Gulch, and near the Micawber, and the following

occur at various altitudes up to timber line in the Micawber Mine Gulch: *Artemisia scopulorum*, *A. franserioides*, *Antennaria dioica*, var. *rosea*, D. C. Eaton, (remarkable nodding forms at timber line), *Troximon aurantiacum*, *T. glaucum*, f. *alpestre*, (beak of akenes about 6 millemeters long, hardly as long as the pappus, the bracts with dark blotches outside, the leaves narrow, and entire). *Cnicus Parryi*, *Aplopappus Parryi*, *Erigeron glabellus*, var. *mollis*, and *Arnica cordifolia*. *Helianthus petiolaris*, near the Micawber, sprung from a dropped seed, and looked strangely out of place.

CAMPANULACEÆ. *Campanula rotundifolia*, Horseshoe Bend Gulch and Micawber Mine Gulch.

ERICACEÆ. *Moneses uniflora* and *Pyrola secunda*, near the lakes; and *Arctostaphylos Uva-ursi*, *Vaccinium myrtillus* and *Pyrola rotundifolia* var. *uliginosa*, near the Micawber. The *Vaccinium* replaces *Arctostaphylos* as we ascend.

PRIMULACEÆ. *Dodecatheon media* in the Micawber Mine Gulch, and var. *alpinum*, near the lakes. *Primula Parryi* is conspicuous in Swift Creek Gulch, and Horseshoe Bend Gulch.*

APOCYNACEÆ. *Apocynum androsæmifolium* near the Micawber.

GENTIANCEÆ. *Frasera speciosa* is abundant at timber line, near Brush Creek, and lower down one meets with *Gentiana heterosepala*, and near the Micawber *G. barbellata*, the latter being also found near the lakes. I found *Swertia perennis* in flower at the lakes in September, and Mrs. E. B. Cox showed me a specimen of *Gentiana frigida* also collected there.

POLEMONIACEÆ. *Polemonium humile* var. *pulchellum* and *P. confertum*,† near the lakes, the latter at timber line, above Brush Creek, where also occurs *Phlox cæspitosa*—a form with the corolla-tube much exceeding the calyx.

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* *P. angustifolia* occurs near the top of the range, not far from the lakes, but on the Saguache County side.

† It may here be worth while to record that Mr. W. C. Roby sent me a specimen of what is apparently without doubt *P. viscosum*, Nutt., collected at 12,000 feet on Holy Cross Mountain. This adds a new locality for this rare species.

HYDROPHYLLACEÆ. *Phacelia sericea*, near the lakes, and *Hydrophyllum occidentale* var. *Fendleri*, near the Micawber Mine.

BORRAGINACEÆ. *Mertensia Sibirica* and *Omphalodes nana* var. *arctioides*, both near the lakes and near Brush Creek—the last of course, at timber line, its brilliant blue flowers almost dazzling. *Mertensia lanceolata* occurs above timber line, near Brush Creek, and near the Micawber we get *Echinospermum floribundum*.

SCROPHULARIACEÆ. *Pedicularis Grænlandica*, at the lakes; *Pentstemon glaucus* var. *stenosepalus*, both at the lakes and at timber line, above Brush Creek. *Mimulus luteus* and *Pedicularis procera* occur near the Micawber. The various forms of *Castilleia* have already been discussed in a previous paper. *Veronica alpina* and *Pentstemon cæspitosus* are found in the gulch above the Micawber.

OROBRANCHACEÆ. *Aphyllon fasciculatum*, at the Micawber.

LABIATÆ. Not one observed!

CHENOPODIACEÆ. *Chenopodium album*, introduced accidently at the Micawber, but useful as an excellent substitute for spinach.

POLYGONACEÆ. *Eriogonum flavum* and *Polygonum Bistorta*, above the timber line, near Brush Creek.

ELÆAGNACEÆ. *Shepherdia Canadensis*, near the Micawber.

URTICACEÆ. *Urtica gracilis*, near Brush Creek.

CUPULIFERÆ. *Quercus undulata*, on sunny slopes near the Micawber and in Horseshoe Bend Gulch.

SALICACEÆ. *Salix monticola*, near the Micawber, and plenty of *Populus tremuloides*. Higher up, the quaking-aspen is reduced to a f. *nana*, 6 to 10 feet high, stems branching from the base upwards, with the small leaves, and red petioles.

CONIFERÆ. *Picea Engelmanni*, below the lakes; and *P. pungens*, near the Micawber, as well as *Juniperus communis* var.

alpina. A *Pinus* doubtfully referred to *flexilis* occurs near the Micawber Mine.

LILIACEÆ. *Allium reticulatum* and *Streptopus amplexifolius*, near the lakes, the first being characteristic of high altitudes. *Zygadenus*, near the Micawber, and also *Allium cernuum* f. *obtusum*, with rose-colored flowers, and obtuse perianth-segments.

JUNCACEÆ. *Juncus Mertensianus*, at the lakes, and *Luzula parviflora*, near Brush Creek.

CYPERACEÆ. *Carex Gayana* and *C. atrata* v. *ovata*, near Brush Creek.

GRAMINEÆ. *Bromus ciliatus*, *Agrostis niemalis* and *Elymus Americanus*, near Brush Creek. *Phleum pratense*, is a "casual" near the Micawber.

HEPATICÆ. *Marchantia polymorpha*, at the Micawber.

FUNGI. *Hypocrea Richardsoni*, *Melampsora salicina*, *Phragmidium subcorticium* and *Lycogala epidendrum*, near the Micawber. I observed, and have made descriptions of, seven species of *Agaricus*, one *Coprinus*, and one *Boletus*, but I have not yet been able to identify them.

LICHENES. *Usnea barbata* produces a very striking effect in Swift Creek Gulch and Horseshoe Bend Gulch.

The features of an alpine flora are very striking as compared with those of lower altitudes. Many orders and genera, so abundantly represented further down, are here only conspicuous by their absence. Such plants as the gentians and saxifrages become abundant. The prevalent colors change; blue and pink flowers become commoner, yellows and reds more rare. Nor is this phenomena in any way confined to our present district: Mr. F. W. Anderson, whom I questioned on the matter, wrote me that he had observed the same thing in Montana.* Hereafter, I hope to be able to elucidate this matter more fully. It is of great

* Mr. Anderson wrote, (December 4th, 1889)—"Yes, blues and pinks do seem to replace yellows and reds in alpine regions, and not necessarily high alpine either; but our difference in latitude may make up for the lack of extremely high altitude. Examples you ask for! Phloxes, Lupins, Asters, Erigerons, Gentians, Astragali, Pentstemons, Delphiniums."

interest, as here, at any rate, we seem to see the manifest result of environment in inducing changes which finally become sufficiently fixed to produce new species. In my former paper on *Castilleia* I have shown how pink replaces scarlet; in this paper some interesting cases of color-variation are recorded, but many more instances might be given, illustrating the effect of altitude. Dr. Weismann, whose views on the non-inheritance of acquired characters are now exciting so much attention, has considered it not unlikely that changes in organisms produced by climatic influences may be inherited, a reservation which seems to be endorsed by all experience.

Dr. A. R. Wallace, in "Darwinism," (p. 401), remarks on the apparent scarcity of monocotyledonous plants in the Rocky Mountains. Although published works, and indeed this present list, would seem to confirm this view, I do not think it is actually the case; the grasses, etc., of high altitudes in the West not yet having received the same amount of attention as those of the eastern or northeastern regions. When we know the flora completely, surely the percentage of Rocky Mountain monocotyledonous plants will be increased. Dr. George Vasey seems to be of the same opinion, for he writes me, (March 8th, 1890): "It appears to me that monocotyledonous plants are as numerous proportionately in high altitudes as in lower ones." Dr. Wallace himself, to whom I stated my objection, replies, (February 10th, 1890): "In the Rocky Mountains I think there is a real scarcity of monocotyledons, especially bulbous Liliaceæ, Amaryllids and Orchises. This struck me as being the case."

No doubt, excluding the grasses and carices, this may hold good, at least with regard to the comparison of very high altitudes with rather more moderate ones. But in the Wet Mountain Valley, (about 8,000 feet), there are eight species of orchids.

I made a catalogue of the high altitude plants mentioned in Dr. Britton's lists of Dr. Rusby's South American gathering, and although the result is interesting, it is not suitable for comparison with the present list, as from the plants listed, 10,000 feet near La Paz would seem to correspond climatically with about 7,000 feet, (or perhaps lower), in Colorado.

WEST CLIFF, CUSTER CO., COLORADO.

A Comparative Study of the Styles of Compositæ.*

By J. S. Chamberlain.

(Plates CXVII and CXVIII.)

The order Compositæ contains more species than any other order of the flowering plants. Bentham[1] estimated the number of species known to him at nearly ten thousand. They are distributed in seven hundred and fifty genera, collected into thirteen tribes.

The two hundred and thirty-five genera native to North America are distributed in eleven tribes, and according to Dr. Gray[2] comprise one-eighth of the Phænogams of the continent.

Although the order contains so many species, it is so remarkably distinct and uniform throughout that a species is seldom wrongly referred to or excluded from it.

But to correctly place these ten thousand species in their proper genera, and these in their proper tribes, has been an immense undertaking for systematic botanists. It has been necessary to use characters derived from almost every part of the flower, differences in the inflorescence, corolla, pappus, appendages of the anthers, style, sexual differences, etc., many of which in other orders are considered of only secondary importance.

Linnæus, who arranged the Compositæ into four great tribes, based his classification on sexual differences. Henri Cassini[3] undertook a revision of the order, and in his classification made use of the style characters for the first time. Lessing[4] and De Candolle[5] made revisions of the order. They, more than Cassini, made use of the style characters. Great and valuable work has been accomplished by Dr. Gray, who in his various works on North America Botany has made use of the style characters in

* Among the most convenient characters for separating tribes of the Compositæ is the structure of the style, but teachers seldom use this. With the hope that teachers will use this character more generally Mr. Chamberlain has studied in my laboratory the principal tribes and genera in Gray's Manual. The results of his labors are presented here.—L. H. Pammel.

[1] Notes on Compositæ, p. 336.

[2] Synoptical Flora of North America, p. 49.

[3] Opuscules Botaniques.

[4] Syn. Generum Compositarum.

[5] Prodromus.

distributing the Compositæ. Bentham[6] who carefully revised the order for the "Genera Plantarum" after considering all points says: "The style branches of the hermaphrodite florets afford one of the most useful characters for the determination of genera and some tribes; but all attempts to take it as absolute have hitherto miserably failed, and it must always be considered in combination with other characters." The character of the venation of the corolla, used by David Don[7] and the differences of the achenium used by G. Schultz Bipontinus, were considered of great importance by these authors.

The pappus, which has been used somewhat, is of much greater diagnostic value than the achenium, as it is constant in species and in natural genera and tribes.

The appendages of the anthers, which are attached either to the base or the apex in some genera and tribes, are of some value. Peculiarities of the corolla also furnish characters which are of some importance.

The styles in different genera of the order, deviate sufficiently in structure to enable us to use them for tribal or generic characters, and a study of their structure is the subject of this paper.

The styles of the perfect hermaphrodite flowers of the Compositæ are two-branched and furnished with two kinds of hairs, viz., stigmatic papillæ and brush hairs. The stigmatic papillæ are on the inner face of the style branches, arranged in one line, as in *Vernonia* or *Helianthus*, or in two lines, as in *Helenium* or *Aster*, and extend up from the base of the branches to the tip, as in *Vernonia*, or for only a part of the distance, as in *Eupatorium* and *Aster*. The papillæ are usually short, with either an acute or obtuse tip, but never acuminate.

The brush hairs, or collecting hairs as they are sometimes called, are arranged in several ways, e. g., in a truncate bunch at the tip of the branch, as in *Senecio;* or along the outer face of the branches, extending sometimes below the fork, as in *Vernonia*, and sometimes just to the fork, as in *Solidago;* or covering both faces of the branch above the termination of the stigmatic lines as in *Aster*. The function of the brush hairs is to brush out and collect the pollen from the anther tube.

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[6] L. c.

[7] Monographs on Compositæ.

Before the flower opens the style branches are closed within the flower. The lines of stigmatic papillæ are closed in against each other on the inner face of the style branches and thus remain unexposed until after the flower opens and the branches separate.

When the flower opens the style pushes up through the anther tube and the brush hairs brush out and collect the pollen as the anthers dehisce.

The pollen thus held by the brush hairs is usually removed by insects before the stigmatic papillæ are exposed. Self-pollination is therefore not likely to occur. As the style grows, the branches separate, often curving far back, and the stigmatic papillæ are in a position to be readily pollinated by insects. By this mechanism cross-pollination of the Compositæ seems almost certain, though self-pollination does occur.

In *Xanthium*, which is anemophilous, the brush hairs are not needed, and consequently they are more or less abortive.

In the female flowers the style is always two-branched, but brush hairs are absent, as they would be useless. The stigmatic papillæ cover the entire inner face of the branches or are arranged in two lines. Some exceptions occur, however, as in *Inula*[8] where the style of the pistillate ray flowers is like that of the hermaphrodite flowers.

In male flowers the style is either entire or two-branched sometimes both forms occurring in the same genus. The pistil being sterile it has no function to perform except that of removing the pollen from the anther tube, and consequently we find brush hairs but no stigmatic papillæ.

Cassini[9], Lessing[10], De Candolle[11], and Lindley[12], in their classifications seem to have noticed only the variations in the shape of the branches, while the differences in arrangement, size, shape, etc., of the brush hairs and the stigmatic papillæ was unnoticed. Le Maout and Decaisne[13], Bentham[14] and Gray[15] all notice the brush hairs and stigmatic papillæ to some extent, the latter using them for distinct tribal characters.

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[8] Lubbock :—British Wild Flowers in Relation to Insects, p. 115.

[9] L. c. [10] L. c. [11] L. c. [12] Flora Medica, p. 450.

[13] Descriptive Botany, p. 497.

[14] L. c., p. 349. [15] L. c., p. 49.

F. Hildebrand[16], who has given a thorough description, with plates, of the genera studied by him, notices the brush hairs and stigmatic papillæ closely, the purpose of his paper being to point out the mechanism for pollination.

Bentham and Hooker in "Genera Plantarum" divide the order Compositæ into thirteen tribes, of which ten are included in the revised edition of Gray's New Manual, as follows: 1 *Vernoniaceæ*, 2 *Eupatoriaceæ*, 3 *Asteroideæ*, 4 *Inuloideæ*, 5 *Helianthoideæ*, 6 *Helenioideæ*, 7 *Anthemideæ*, 8 *Senecionideæ*, 9 *Cynaroideæ*, 10 *Cichoriaceæ*. In Gray's "Synoptical Flora of North America" one other tribe is given, viz: *Mutisiaceæ*. In the arrangement of tribes I have followed Gray. In most cases the genera in each tribe are taken up as they appear in the Manual.

VERNONIACEÆ (plate CXVII fig 1–6).

Of the Vernoniceæ Gray says: "Style branches slender, filiform or attenuate subulate, acute, hispidulous or hispid; stigmatic lines only near the base."

Bentham says: "Stigmatic lines near the base on the inner surface not very conspicuous."

I do not, however, find the arrangement of the stigmatic papillæ as they are described by these authors.

In *Vernonia* and *Elephantopus*, the stigmatic papillæ are arranged in one line, occupying about one-third of the inner face of the branches and extending up the center of this face from the base to within a very short distance of the tip.

This is nearly as Hildebrand[17] has described it except that a single stigmatic line occupies the whole inner face. The stigmatic lines are very distinct and are essentially the same in *Vernonia* and *Elephantopus*. The papillæ in both genera are short, broad at the base and taper to an acute point. The brush hairs cover the entire surface not covered by papillæ and extend for some distance below the forks.

Vernonia[18] (Fig. 1-5).

V. Arkansana, DC. The branches of the style are terete, long, (about one-fourth the length of the style)

[16] Ueber die Geschlechtsverhältnisse bei den Compositen.

[17] L. c., p. 14.

[18] Hildebrand l. c., p. 14. Cassini l. c., p. 22.

slender, tapering gradually to an acute tip. The arrangement of papillæ and hairs is as described for the tribe. The brush hairs (fig. 5) are large, linear and taper to an acute tip. They extend below the forks about two-thirds the length of the branches and cover the surface thickly.

Elephantopus (Fig. 6).

E. Carolinianus, Willd. The branches of the style are much like those of *Vernonia* except in an obtuse tip. The brush hairs (fig. 6) taper rapidly to an acuminate tip and are only about one-half the length of those of *Vernonia Arkansana*. The brush hairs extend below the forks for only about one-fourth the length of the branches.

EUPATORIACEÆ (plate CXVII, fig. 7–23).

Gray[19] says: "Style branches elongated, more or less clavate or thickened upward, minutely papillose or puberulose or glabrous; the stigmatic lines only near the base and inconspicuous."

In three of the six genera studied the style was very plainly club-shaped. In the others it was merely more cylindrical above the end of the stigmatic lines. The clavate character of the branches is, therefore, not uniform for all the genera of the tribe, as stated by some. They are either clavate or mostly cylindrical above. Stigmatic lines only near the base is true in most cases.

In some genera, however, as in *Mikania*, the stigmatic lines extend up for more than two-thirds the distance. A uniform character was, however, found in all six genera studied, namely, the stigmatic lines are always very narrow along the outer edges of the branches and the brush hairs cover the entire surface or the greater part of it above the end of the stigmatic lines.

Kuhnia (Fig. 7–11).

K. eupatorioides, L. Style branches distinctly club-shaped, as shown in figs. 7–9. The stigmatic papillæ (fig. 11) are arranged in two narrow lines along the edges of the branches and occupy the lower three-sevenths of the branches. The papillæ are moderately large and acute. The brush hairs (fig. 10) cover almost the entire surface above the end of the stigmatic lines. They are very obtuse and broad.

[19] L. c., p. 51.

Mikania (Fig. 12–14a).

M. scandens, (L.) Willd. Style branches (fig. 12–13) are not clavate as in *Kuhnia*, but are cylindrical above the end of the stigmatic lines. The stigmatic papillæ (fig. 14a) are arranged in two lines as in *Kuhnia*, but are wider and occupy fully two-thirds of the length of the branch. In shape they differ only slightly from *Kuhnia*. The brush hairs (fig. 14) are larger and more acute than in *Kuhnia*. They do not cover the entire surface, but leave a narrow uncovered portion along the center of the branch.

Eupatorium[20] (Fig. 15-16).

Eupatorium altissimum, L. The style branches are distinctly clavate. Stigmatic papillæ (fig. 16) are arranged as in *Kuhnia* and occupy the lower two-fifths of the branch. The brush hairs (fig. 15) cover nearly the entire surface above the end of the stigmatic lines. The largest hairs are just above the end of the stigmatic lines.

According to Cassini, as quoted by Hildebrand, the styles of *Eupatorium purpureum*, *E. sessilifolium*, and *E. altissimum* are like *Eupatorium cannabinum*.

Brickellia (Fig. 17-18).

B. Wrightii, Gray, var. *tenera*, Gray. The style branches are nearly like those of *Kuhnia*, only becoming more gradually clavate, while the tip is more acute. Stigmatic papillæ (fig. 18) are nearly like those of *Kuhnia* in shape, size and arrangement. The brush hairs (fig. 17) are like those of *Kuhnia* in all respects.

Liatris (Fig. 19-20).

L. squarrosa, (L.) Willd. The style branches are not clavate, but the upper part is very long and cylindrical. The stigmatic lines, which are very narrow at the base of the branches, become somewhat broader before they terminate. They occupy only about one-third of the length of the branch (fig. 20). The brush hairs are arranged as in the other genera. In the full grown style they are broad at the base, and taper to a rather acute point (fig. 19). According to Hildebrand[21] they are long and slender before the flower opens, later they become broader at the base, but do not grow in length.

[20] Hildebrand l. c., p., 16.

[21] L. c., p. 17.

Trilisia (Fig. 21-23).

T. paniculata (Walt.) Cass. Style branches not clavate but cylindrical longer and more acute than in *Mikania*. Stigmatic papillæ (fig. 23) about the same as in *Mikania*, but occupy only one-third of the branch, and are in slightly narrower lines. Brush hairs (fig. 21, 22) cover the entire surface above the stigmatic lines.

ASTEROIDEÆ (plate CXVIII, fig. 1-38).

Gray[24] describes the style as follows: "Style branches of hermaphrodite flowers flattened, conspicuously margined by the stigmatic lines and extending into a hispid or papillose (sometimes very short) appendage."

The following genera have been studied: *Grindelia*, *Heterotheca*, *Chrysopsis*, *Aplopappus*, *Bigelovia*, *Solidago*, *Brachychæta*, *Bellis*, *Townsendia*, *Sericocarpus*, *Aphanostephus*, *Boltonia*, *Aster*, *Erigeron* and *Baccharis*.

In all these the style agrees with the description given by Dr. Gray for the tribe. There is a difference, however, in the arrangement of the stigmatic papillæ and brush hairs that makes the following division of the tribe possible, so far as my studies have extended.

DIVISION I.

Style branches of the hermaphrodite flowers flattened, tapering from the base or just above the base to an acute or obtuse point. The stigmatic lines are distinct in two lines along the outer edges and tip. They occupy not more than one-half of the branch. The brush hairs covering the outer surface extending down between the stigmatic lines or leaving an unoccupied space along the center. The inner face is not covered with brush hairs except at the very tip and along the edges. This subdivision includes the genera: *Solidago*, *Grindelia*, *Heterotheca*, *Chrysopsis*, *Aplopappus*, *Bigelovia*, *Brachychæta*, *Bellis*, *Townsendia* and *Sericocarpus*.

DIVISION II.

Style branches flattened, linear from the base to the end of the stigmatic lines. Stigmatic papillæ in two lines as in (I), but

[24] L. c. p. 52.

occupying more than one-half of the length of the branch. The brush hairs forming a triangular appendage at the end of the stigmatic lines and nearly equally covering both faces of the branch. The hairs on the outer face extend only a short distance below the end of the stigmatic lines. This subdivision includes the genera *Aster*, *Aphanostephus*, *Erigeron* and *Boltonia*. *Baccharis* has both staminate and pistillate flowers, and does not belong to either of the above.

Solidago[23] (plate CXVIII, fig. 1-3).

S. Canadensis, L. The general characters of the style have been given in the description of subdivison I. The stigmatic lines extend up a little less than one-half of the distance to the tip (fig. 1, 2). The brush hairs cover the entire outer surface, and the tip and edges of the inner face above the stigmatic lines (fig. 1, 2). Stigmatic papillæ short, acute. Brush hairs long, cylindrical and obtuse. The shape and relative size of both papillæ and hairs is shown in figure 3.

Grindelia[25] (Fig. 4, 5).

G. squarrosa (Pursh), Dunal. Style branches much like *Solidago*, only longer and not as broad, gradually tapering to an obtuse point. Stigmatic lines occupy one-half of the length of the branch. Stigmatic papillæ (fig. 5) more slender than in *Solidago*. Brush hairs (fig. 4) do not extend as far down the back as in *Solidago*.

Heterotheca[26] (Fig. 6, 7).

H. subaxillaris (Lam.), Britt. Style branches enlarged at the base and tapering to a smaller point than in *Solidago* or *Grindelia*. Stigmatic lines occupy one-half of branch. Brush hairs do not occupy outer or inner face entirely, but leave a narrow zone along the center of both faces. Stigmatic papillæ shorter and more obtuse than in *Solidago* (fig. 7). Brush hairs broader and shorter (fig. 6).

Chrysopsis[24] (Fig. 8, 9).

C. villosa (Pursh), Nutt. Style branches almost identical with

[23] Hildebrand, l. c., p. 22. Müller, l. c., p. 320.
[25] Gray, l. c., p. 53.
[26] Gray, l. c., p. 53.
[24] L. c., p. 53.

those of *Heterotheca*. The brush hairs (fig. 9) are arranged as in *Heterotheca*. The papillæ (fig. 8) are arranged similarly, but are longer and more acuminate.

Aplopappus (Fig. 10, 11).

A. racemosus (Nutt.), Torr. Style branches longer and more tapering than in *Solidago*. Stigmatic papillæ (fig. 11) are about the same shape as in *Solidago*, and occupy one-third of the branch. The brush hairs (fig. 10) are of very different lengths, the largest being larger than any others in the tribe.

Bigelovia (Fig. 12, 13).

B. nudata (Michx.), DC. Style branches slightly broader than in *Heteratheca*. The stigmatic lines occupy hardly one-half of the branch. The papillæ (fig. 13) about as in *Solidago*. Brush hairs (fig. 12) broad and obtuse.

Brachychæta (Fig. 14, 15).

B. cordata (Short), Torr. & Gray. Branches of the style short and obtusely pointed. Stigmatic lines occupy one-third of the branch. The papillæ (fig. 15) are smaller than in *Solidago*. Brush hairs (fig. 14) broader and shorter.

Bellis[27] (Fig. 16, 17).

B. integrifolia, Michx. Style branches essentially as in *Solidago*. Stigmatic lines occupy a little more than one-third of the branch. The papillæ (fig. 17) are smaller than in *Solidago*, while the brush hairs (fig. 16) are broader and shorter.

Townsendia[28] (Fig. 18, 19).

T. eximia, Gray. Style branches long and tapering. Stigmatic lines occupying one half of branch. The papillæ (fig. 19) are smaller than in *Solidago*. Brush hairs (fig. 18) acuminate as in *Chrysopsis*.

Sericocarpus[29] (Fig. 21, 21a).

S. asteroides, (L.) B.S.P. Styles branches very long and slender, about twice the length of *Solidago*. Stigmatic lines occupy about one-fourth of the branch. See figure 21 for papillæ. The brush hairs are shown at figure 21a.

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[27] Gray, l. c., p. 55. Müller, l. c., p. 321. Hildebrand, l. c., p. 23.

[28] Gray, l. c., p. 56.

Gray, l. c., p. 56.

DIVISION II.

Aster[30] (plate CXVIII, fig. 22-28).

A. Novæ-Angliæ, L. The style branches of the hermaphrodite flowers are about the same length as those of *Solidago*, but are flattened and much narrower. The stigmatic lines are broader and more distinct than in the first division. They occupy two-thirds of the branch. The branches are linear to the end of the stigmatic lines; above this portion of the branch the brush hairs form a triangular appendage, the hairs almost covering both faces, extending down somewhat between the lines on the outer face (fig. 22, 23). The papillæ (fig. 28) are short and obtuse. Brush hairs (fig. 27) are rather short and broad. The style branches of the pistillate ray flowers are narrow and acuminate, while the papilllæ occur in two lines along the edges, the brush hairs being absent (fig. 24-26).

Erigeron (Fig. 29-33).

E. Philadelphicus, L. Style branches about one-half as long as in *Aster*. Stigmatic lines occupy two-thirds of the branch, brush hairs covering both faces above the end of the stigmatic lines and forming a triangular appendage (fig. 29-31). The stigmatic lines are narrower and the papillæ larger than in *Aster* (fig. 33). Brush hairs are shorter and more obtuse (fig. 32).

Aphanostephus[31] (Fig. 34, 35).

A. ramosissimus, DC. Style branches like those of *Erigeron*, but only half as long. Stigmatic lines occupy three-fourths of branch. The appendage of the brush hairs is very short. The papillæ are smaller than in *Erigeron* (fig. 35), whereas the brush hairs are narrower and more obtuse (fig. 34).

Boltonia[32] (Fig. 36, 37).

B. asteroides (L.) L'Her. Style branches very broad in proportion to their length, being about one-third as broad as they are long. In length they are like those of *Erigeron*. Stigmatic lines occupy four-fifths of the branch. The brush hairs form a mucronate-pointed appendage. The papillæ (fig. 37) and brush hairs (fig. 36) are nearly like those of *Erigeron*.

[30] Gray, l. c., p. 56.
[31] Gray, l. c., p. 55.
[32] Gray, l. c., p. 56.

Baccharis[33] (Fig. 20, 38).

B. halimifolia, L. Style branches of the staminate flower are shown in figure 38. The entire outer face and edges of the inner are covered with brush hairs. Stigmatic papillæ do not occur on the remainder of the inner face. The brush hairs are cylindrical, obtuse (fig. 20).

The branches of the pistillate flowers are twice as long as in the staminate. They are linear in shape, with an acute point. The papillæ occur in two narrow lines along the edges.

INULOIDEÆ[34] (plate CXVIII, figs. 39-44).

In this tribe the heads are heterogamous or diœciously homogamous, and the style, therefore, in most cases, does not possess both brush hairs and stigmatic papillæ; the relative arrangement of the brush hairs cannot therefore be used as a distinctive character. The style of the hermaphrodite sterile flowers is either two-branched or entire. The style of the pistillate flowers is two-branched, but there is no variation in the arrangement of the papillæ. Gray says: "The style branches of the hermaphrodite flowers are flattish or filiform, not appendaged."

Pluchea[35] (Figs. 39, 40).

P. camphorata, (L.) DC. The style of the hermaphrodite sterile flowers is entire or two-cleft. The branches of the two-cleft style are terete, short in proportion to their length. The brush hairs cover the entire outer surface of the branches. Below the base of the branches the style is covered with glands (fig. 39). The brush hairs (fig. 40) are short and obtuse. The style of the pistillate florets is two-branched, with both faces covered, or nearly so, with papillæ.

Antennaria[36] (Figs. 41-44).

A plantaginifolia (L.), Hook. The style of the staminate flowers is two-cleft or entire. The branches of the two-cleft style are somewhat clavate, covered over the outer face and edges of the inner with brush hairs. The remainder of the inner face does not

[33] Gray, l. c., p. 57.

[34] Gray, l. c., p. 57. Bentham, l. c., p. 377. Lubbock, l. c., p. 115. Hildebrand, l. c., p. 40.

[35] Gray, l. c., p. 57.

[36] Gray, l. c., p. 58.

possess stigmatic papillæ (fig. 41). The brush hairs (fig. 42) are short and obtuse. The style of the pistillate flowers is two-cleft. The branches are slightly tapering, the stigmatic papillæ cover the greater part of both faces (fig. 43). The papillæ are small and obtuse (fig. 44).

(*To be continued*).

Notes on the Flora of North Carolina.

By A. A. Heller.

The morning of June 19, 1890, found me in the "Old North State," whither my imagination for many months past had carried me almost daily.

On the road to my headquarters near Heilig's Mill post-office, twelve miles south of Salisbury, many things besides the heat of the sun indicated that I was in a part of the world which was new to me.

Ripe blackberries in June were a novelty, and one that claimed my attention from an internal point of view. Great bunches of the brick-red flowers of *Tecoma radicans*, Juss., were plentiful along the road, and so were those of the pretty, purple-rayed *Passiflora incarnata*, L. But the prettiest of all was *Schrankia angustata*, T. and G., with its heads of pink flowers.

On the 20th I did my first collecting, on the road from Salisbury to Heilig's Mill. *Polygala Curtissii*, Gray, was just coming into bloom, and a few plants of *Silene Virginica*, L., and *Asclepias verticillata*, L., were found. A plentiful supply of *Bupleurum rotundifolium*, L., was obtained at one place, and a stop of a few minutes at the "Rocks," six miles south of Salisbury, added *Ilysanthes refracta*, Benth., and *Utricularia cornuta*, Mx., to my list.

On the 21st I made an expedition with the "Parson" to his Bear Creek congregation, twelve miles farther south, and while he was dispensing spiritual food in the shape of catechism, I explored the vicinity. Some of the more important results were: A fruiting specimen of *Rhododendron calendulaceum* (Michx.) Torr. *Coreopsis senifolia*, Mx., which was plentiful, several specimens each of *Clitoria Mariana*, L., and the short, erect form of *Tephrosia*

spicata, T. and G., a *Cratægus* which further investigation may prove to be a new species, *Aletris farinosa*, L., and *Panicum viscidum*, Ell.

On the 28th I had an opportunity of spending an hour or two at the "Rocks." This is a section of serpentine, if my limited knowledge of geology is not at fault. Large boulders lie scattered around, and on a level with the surface are large flat rocks of the same formation, some of them many square feet in extent. Nearly all of these were covered with lichens, especially a species of *Cladonia*.

On some of them I found *Talinum teretifolium*, Pursh, *Crotonopsis linearis*, Mx., and the withered stalks of what seems to be an *Arenaria*.

In the serpentine belt I found, in addition to the plants above mentioned, *Yucca filamentosa*, L., in fruit, *Marshallia lanceolata*, Pursh, *Gratiola pilosa*, Mx., *Callicarpa Americana*, L., and *Polypodium incanum*, Pursh, while on its borders were *Parthenium integrifolium*, L., *Oxydendrum arboreum* (L.), DC., *Psoralea melilotoides*, Mx., *Lobelia Nuttallii*, R. and S., and two forms of *Viburnum nudum*, L.

Another trip on the 4th of July as far as the southern borders of this section yielded such things as *Jatropa urens*, L., var. *stimulosa*, Muell., *Rhynchosia erecta*, DC, *Polypremum procumbens*, L., the long, trailing form of *Tephrosia spicata*, T. and G., *Rhexia Mariana*, L., *Eriocaulon decangulare*, L., and *Xyris Caroliniana*, Walt.

Little expeditions within a radius of a mile or two of headquarters brought forth some pretty good things.

In the woods a short distance below the house I found a number of fine plants of *Clematis ochroleuca*, Ait. In another place on the edge of a field is a large patch of *Thymus Serpyllum*, L., which must have escaped from the church-yard about one hundred yards east of it.

Delphinium Ajacis, L., is rather common, one field especially being almost blue with it. This plant I have sent out under the name *D. Consolida*, L., but a more careful study of it has shown that the latter name is wrong.

The question is, Is *D. Consolida* found at all in the South, or has *D. Ajacis* been mistaken for it thus far?

In some of the fields there was an abundance of *Gnaphalium purpureum*, L., which is not simple, like the form found in the North, but profusely branching from the base, there being a dozen or more stalks from one root.

Silphium Asteriscus, L., was found along the "branch" west of the church, but not abundantly.

On a little slope just east of the churchyard is a small tree of *Cratægus spathulata*, Mx. The fruit of this, as well as that of all the others which I found, except *C. flava*, Ait., was covered with a pink fungoid growth resembling little spines. Near by were *Hypericum virgatum*, Lam., and *Pentstemon lævigatus*, Soland. The latter plant, which I found at several places in the vicinity, but in fruit only, seems to be the typical one.

Ruellia ciliosa, Pursh, was not uncommon in the woods and along the roadsides, while in old fields there was an abundance of *Cyperus ovularis* (Vahl.), Torr., and *Lechea tenuifolia*, Mx. In a moist place in a woods were three plants of *Amianthium muscætoxicum* (Walt.), Gray.

Some other plants of the vicinity are *Sabbatia paniculata*, Pursh, *Lechea racemulosa*, Lam., *Crotalaria sagittalis*, L., *Paspalum Floridanum*, Mx., *Ascelpias variegata*, L., *Vaccinium arboreum*, Mx., *Bletia aphylla*, Nutt., *Agave Virginica*, L., and *Linum striatum*, which latter, according to the last edition of Chapman, has been found only in South Carolina.

On the 17th of July I started for the mountains, taking the Western North Carolina Railroad from Salisbury to Hickory, there changing to the narrow gauge road which runs from that place to Lenoir. From Lenoir to Blowing Rock, a distance of twenty miles, one must travel by stage, about half the distance being up the mountain.

As this was my first visit to the mountains, I enjoyed the ride very much. At two places where the road winds along the mountain side, there are splendid views. In front Grandfather towers above all the rest like a huge sentinel, with perchance a cloud floating over its summit. Father to the left are Hawk's Bill and Table Rock, while sweeping around in a great semicircle

is a sea of mountains, which far away on the horizon seems to lose itself among the clouds.

Blowing Rock is a summer resort, situated almost on the backbone of the Blue Ridge, at an altitude of 4000 feet. The Blowing Rock itself is one of a series of ledges which jut out along the mountain side. There is generally a stiff breeze blowing over it from the trough-like valley below; hence its name.

My first botanizing was done on its ledges, and I was well pleased with the result. *Saxifraga leucanthemifolia*, Mx., was not plentiful, but more vigorous than at any other place where I saw it. *Heuchera villosa*, Mx., *Amianthium muscætoxicum* (Walt.), Gray, *Sedum telephioides* Mx., *Potentilla tridentata*, Ait., *Clethra acuminata*, Mx., and *Carex æstivalis*, M. A. Curtis, were represented, as was also the beautiful *Paronychia argyrocoma*, Nutt., which grew in mats upon the rocks. There was also a peculiar form of *Allium cernuum*, Roth., with deep pink-purple flowers.

In the woods back of the rocks I found *Galium latifolium*, Mx., *Galax aphylla*, L., *Danthonia compressa*, Austin, the typical form of *Houstonia purpurea*, L., *Tradescantia pilosa*, Lehm., and *Pentstemon lævigatus*, Soland., which is quite different from the one collected in the vicinity of Salisbury. This one grows much taller, has larger and thinner leaves, and dark pink flowers. The flowers, however, were scarce, but there was plenty of good fruit.

Down in the dark, shady hollow below the rocks were *Melanthium parviflorum* (Mx.), Watson, and *Spiræa Aruncus*, L., with their Northern neighbors, *Orchis spectabilis*, L., and *Clintonia borealis* (Ait.), Raf.

Early on the morning of the 22d I started to tramp to Grandfather Mountain, fifteen miles distant. The first thing collected was *Trillium erythrocarpum*, Mx., in fruit. Along the roadside in a shady nook, where a tiny stream trickles into a depression in a large moss-covered rock, were some nice specimens of *Thalictrum clavatum*, DC.

Before arriving at the Watauga river, I found *Actæa alba*, Mill., *Campanula divaricata*, Mx., *Silene Virginica*, L., *Phlox paniculata* L., *Blephilia hirsuta*, Benth., and *Pycnanthemum montanum*, Mx.

At Scholl's Mill the road turns to the left, following the banks

of the Watauga. At one place I picked up a single plant of *Chelone obliqua*, L., and further on, near the foot of Grandfather, a plant of *Corallorhiza multiflora*, Nutt., which is not at all plentiful in that section, and I believe never found before in North Carolina, although it has been reported from Tennessee by Dr. Gattinger.

Climbing Grandfather is a feat not to be despised, especially by one who is trying such a thing for the first time. It was slow and toilsome work, but soon a little inspiration was given by the finding of a patch of *Goodyera repens*, (L.), R. Br.

About half way up is what may be termed the moss belt, for the ground, trunks of trees, logs and rocks, are covered with a thick cushion of moss, and growing in it was *Oxalis Acetosella*, L., with its pretty pink-veined petals.

A half mile from the summit is a spring of almost ice-cold water, which flows from the base of a large cliff. Here was *Carex canescens*, L., var. *alpicola*, Wahl., and *Glyceria elongata*, (Torr.), Trin., hitherto reported only from Roan.

What we may call the first landing of the summit was covered with *Saxifraga leucanthemifolia*, Mx., and *Clintonia borealis* (Ait.), Raf. From the spring until almost to the summit, were large patches of *Chelone Lyoni*, Pursh, its pink-purple flowers making a very pretty appearance. *Monarda didyma*, L., was also well represented, while upon the summit was an abundance of dwarf *Aster acuminatus*, Mx.

Streptopus roseus (Pers.), Mx., *Diphylleia cymosa*, Mx., *Hydrangea arborescens*, L., and *Viburnum lantanoides*, Mx., were found at different points along the trail. But the crowning point was the finding of *Aconitum reclinatum*, Gray, a short distance below the spring.

The wet weather interfered much with my collecting, for it rained during the greater part of the time that I spent in the mountains. Nevertheless I managed to do a little collecting around Blowing Rock, and on the eastern slope of the mountain found *Leiophyllum buxifolium* (Berg.), Ell., *Microstylis unifolia* (Mx.), B.S.P., two plants of *Corallorhiza multiflora*, Nutt., *Habenaria ciliaris*, (L.), R. Br., and a slender, large-leaved form of *Œnothera fruticosa*, L.

On the western slope, facing the head-waters of John's river, were *Leucothoë recurva*, Gray, *Pyrus arbutifolia* (L.), L.f., and a few plants of *Asplenium montanum*, L.

Goodyera pubesceus (Willd.), R. Br., was also found on the mountain top.

On the 1st of August, taking advantage of the clear weather, I started for Table Rock, thirty-five miles distant. For ten miles I followed the banks of John's river, and then turned to the right, going across the mountains by way of Wilson's creek and Piedmont Spring. For a part of the distance the road is a mere path, and the way of the traveler is hard, especially when there are no foot bridges, and the only thing that can be done is to "pull off" and wade.

In the woods along the mountain road were occasional plants of *Tipularia unifolia* (Muhl.), B.S.P., at one place a bush of *Pyrularia oleifera*, Gray, and on the crest of Long Mountain a patch of what seems to be a mountain form of *Liatris graminifolia*, Willd. This, and two from Blowing Rock, one of which has turned out to be a new species, I have sent out as *L. spicata* (L.), Willd.

The summit of Table Rock was reached late in the afternoon of the second day. This rock-capped mountain is a peculiar place, and a magnificent view can be had from it.

Less than an hour is a very little time to spend at such a place, but yet I managed to find some interesting things. One of the first things that met my eye was *Scleria triglomerata*, Mx. *Zygadenus leimanthoides*, Gray, was plentiful, as was also *Vaccinium corymbosum*, L., var. *pallidum* (Ait.), Gray. On the very summit were *Pyrus nigra* (Marsh.), Sargent, only a few inches high, but fruiting abundantly, *Hypericum prolificum*, L., with broader leaves than usual, *Calopogon tuberosu* (L.), B.S.P., and *Xerophyllum asphodeloides* (L.), Spreng.

It seems to me that the top of a mountain almost 4000 feet above sea level is a strange place to find some of the things mentioned above.

Another visit to Grandfather on the 11th of August, while on the road to Roan, added *Leiophyllum buxifolium* (Berg.), Ell., var. *prostratum*, Gray, *Solidago glomerata*, Mx., *Geum genicula-*

tum, Mx., *Menziesia globularis*, Salisb., and a small-leaved form of *Houstonia purpurea*, L.

Roan was a failure botanically, as I found very few new plants. I am now fully convinced that the mountain was not to blame, but myself, for my sole object seemed to be to get there, and then turn around and go back. *Alnus viridis*, DC., was very innocently passed by under the supposition that it was our common *A. serrulata*.

The only noteworthy things that I found were *Hypericum graveolens*, Buckley, collected near the hotel among the *Abies Fraseri*, Pursh, *Lycopodium Selago*, L., and *Geum radiatum*, Mx., along the road on the summit, and *Rudbeckia laciniata* (L.), var. *humilis*, Gray, on the slope facing the Grassy Knob.

The region around Salisbury seemed to be doing its best when I returned in the latter part of August, but I could do very little, as my stay was limited to a few days. However, I collected some thirty species, among which were *Lotus Helleri*, Britton, *Fœniculum vulgare*, Gærtn., *Elephantopus tomentosus*, L., and *Pluchea camphorata* (L.), DC., (*P. purpurascens*, DC.)

My summer's work and experience, of which this necessarily much-condensed article is an account, was very pleasant, and I hope to repeat it during the coming summer with much greater results.

LANCASTER, PA.

Index to Recent Literature Relating to American Botany.

Adiantum Peruvianum. (Gard. Chron. ix. 397, fig. 88).

Apios tuberosa, Mch.—Ueber die Bestäubungseinrichtung und den Anatomischen Bau der Blüthe von. E. Loew. (Flora. ii. 160-171, t. vi).

Aster from California.—A new. J. N. Rose. (Bot. Gaz. xvi. 113, pl. xi).

Aster Orcuttii is figured and described as a new species.

Bromeliaceæ Schenckianæ. L. Wittmack. (Beiblatt, Engler's Bot. Jahrb. xiii. No. 29, 8-24).

A list of forty-five species collected by Dr. H. Schenck, in Southern Brazil. *Pitcairnia Dietrichiana*, *Dyckia rubra*, and *Vricsia Schenckiana*, are described as new.

Carolina Wild Flowers. L. Greenlee. (Vick's Mag. xiv. 154, 155, illustrated).

Description and figure of *Asarum Virginicum.*

Calochortus Leichtlinii. (Gard. Chron. ix. 469, fig. 97),

Canada Thistle—The. (Third Ann. Rept. W. Va. Agric. Exp. Sta., 118-121, pl. viii, ix).

This article is designed as an appeal to the farmers to eradicate *Cnicus arvensis,* and illustrations are given of the root-leaves and mature plant, as it was incidently discovered that other plants were known under the common name of " Canada Thistle "; such species, for instance, as *Echium vulgare* and *Dipsacus sylvestris.* The article concludes with a series of questions in regard to common weeds which are all quoted by their popular or local names.

Contributions to the Knowledge of the Germination of some North American Plants. Theodor Holm. (Mem. Torrey Bot. Club, ii. 57-108; 15 plates).

Mr. Holm has given much careful study to the development of herbaceous plants, and some of his results are included in this Memoir, which is an important and valuable contribution to the literature of germination. The species described are *Anemone thalictroides, Thalictrum dioicum, Ranunculus abortivus, R. recurvatus, Delphinium nudicaule, Sarracenia purpurea, Sanguinaria Canadensis, Viola palmata,* var. *cucullata, Lespedeza violacea, L. procumbens, Clitoria Mariana, Cassia Chamæcrista, Rubus hispidus, Potentilla Canadensis, Saxifraga Virginiensis, Dionæa muscipula, Thaspium barbinode, T. aureum, Osmorhiza longistylis, Sanicula Marylandica, Aralia spinosa, Pilea pumila, Sabal Palmetto, Attalea excelsa, Carludovica palmata, Agave univittata, Eucharis candida, Smilax rotundifolia, S. glauca, Hemerocallis fulva, Yucca gloriosa, Peltandra undulata, Orontium aquaticum, Anthurium Andræanum, Alisma Plantago,* var. *Americanum.* All these are beautifully figured.

Curcurbit.—A New. A. Cogniaux. (Zoe, i. 368, 369; pl. xi).

Description and plate of a new genus aud species, *Vaseyanthus Rosei.*

Cupressus Macnabiana. (Gard. Chron. ix. 403, fig. 90).

Distribution of Northern Plants.—The Relative Altitudes of the

Rocky and Appalachian Mountain Systems as influencing the. Conway MacMillan. (Am. Nat., xxv. 146-150).

Prof. MacMillan calls attention to the fact that the distribution of species of boreal genera in the Rocky Mountain System as compared with the Southern Alleghenies, shows a preponderence of nearly double the number in the former, and accounts for this by the much greater altitude of the western mountains.

Douglas Fir.—The. (Gard. and For. iv. 205, 206, fig. 38).

Earth Stars. F. L. Sargent. (Pop. Sci. News, xxv. 72, 73; illustrated).

A popular illustrated description of *Geaster hygrometricus.*

Egg Plants.—Experience With. L. H. Bailey. (Bull. No. 26, Cornell Agric. Exp. Sta. Illustrated).

This paper begins with a general account of the cultivated varieties, and concludes with a description of their early history and ancestors. *Solanum Melongena*, vars. *esculentum* and *depressum* and *S. integrifolium*, are figured.

Eoichnites and *Ctenichnites*, n. gen. G. F. Matthew. (Trans. Roy. Soc. Can., Sec. iv. 1890. pp. 148-154, illustrated).

The author here describes as markings due to molluscan (?) life, the markings which have heretofore been classed under the vegetable kingdom as *Eophyton* sp.

Eperua Jenmani, Oliv. D. Oliver. (Hook. Ic. Plant. t. 1955).

A new species of this Leguminous genus from British Guiana.

Epichloe Hypoxylon. M. C. Cooke. (Grevillea xix. 80).

According to the specimen in Ellis and Everhardt's N. A. Fungi, this is identical with *Hypocrella atramentosa*, B. and C.

Esenbeckia.—A New Species of. T. S. Brandegee. (Zoe, i. 378; pl. xii).

Description and representation of *E. flava.*

European Aliens in America. A. W. Bennett. (Journ. Bot. xxix. 121).

A short contribution, called forth by the article by Mr. T. D. A. Cockerell on the same subject.

Fomes from Northern Montana.—A New. F. W. Anderson. (Bot. Gaz., xvi. 113, pl. xii).

Fomes Ellisianus, from living trunks and branches of *Shepherdia argentea*, is described and figured as new.

Gentiana Herrediana, Raimondi. D. Oliver. (Hook. Ic. Plant. t. 1962).

Collected by Pearce on the Cordillera of Muña, Peru.

Glimpses of Old Herbals. E. L. Sturtevant. (Am. Gard. xii. 257-261, illustrated).

Gloxinia maculata. (Garden, xxxix. 364, 365; with colored plate.

Gymnogrammes. (Garden, xxxix. 369, 370, illustrated).

Contains representations of *G. Peruviana*, var. *argyrophylla* and *G. pulchella.*

Hepaticæ.—A Preliminary List of Pacific Coast. L. M. Underwood. (Zoe, i. 361-367).

An enumeration of 155 species, ranging from Alaska to California and Idaho.

Kantia Vincentina. C. H. Wright. (Journ. Bot. xxix. 107).

A newly described species from St. Vincent, (H. H. Smith, No. 1389), allied to *K. trichomanis.*

Lælia anceps, var. *holochila.* R. A. Rolfe. (Gard. and For. iv. 172, 173; fig. 31).

Lobeliaceæ.—California. Katharine Brandegee. (Zoe, i. 373-377).

Critical notes, including descriptions and questions of nomenclature.

Native Plants in Field, Forest and Garden. (Am. Gard. xii. 281-291; illustrated).

The following are figured: *Goodyera pubescens, Habenaria ciliaris, Crinum Americanum, Viola pedata, Stuartia Virginica, Quercus virens, Shortia galacifolia, Calla palustris, Zanthorrhiza apiifolia* and *Catalpa speciosa.*

Nebraska Flowering Plants. Goodwin D. Swezey. (Doane College, Natural History Studies No. 1, Pamph. 8vo. pp. 16. Crete, 1891.

This is a list of Nebraska localities for flowering plants in the herbarium of Doane College, based mainly on collections made by Prof. Swezey in a tour through the western part of the State, and by some of his students; 533 species and varieties are enumerated, of which 76 are here first definitely recorded as occurring within the area. The nomenclature is based on the stability of

the oldest specific name, "believing that this is the only rule which can lead ultimately to a settled nomenclature." Two binomials are here first proposed: *Petalostemon compactus* (Spreng) (*P. macrostachyus*, Torr.) and *Elymus elymoides* (Raf.), (*E. Sitanion*, Schultes). The original author is cited in parenthesis. The list is an important supplement to Mr. Webber's Flora. N. L. B.

New or Noteworthy Compositæ from Guatemala. John M. Coulter. (Bot. Gaz. xvi. 95–102).

The following are described as new: *Vernonia Salvinæ*, Hemsl., var. *canescens*, *Eupatorium Donnell-Smithii*, *E. Donnell-Smithii*, var. *parvifolium*, *E. lyratum*, *E. Rafaelense*, *E. ageratifolium*, D.C., var. *purpureum*, *Brickellia Pacayensis*, *Aplopappus stoloniferus*, D.C., var. *glabratus*, *Aphanostephus Pinulensis*, *Clibadium Donnell-Smithii*, *Tetragonotheca Guatemalensis*, *Zexmenia dulcis*, *Bidens Antiguensis*, *Senecio Donnell-Smithii*, *S. Ghiesbreghtii*, Hort. Hal. Regel, var. *pauciflorus*, *S. Cobanensis*.

North Carolina Agricultural Experiment Station, Bulletin No. 73. (Pamph. 8vo. pp. 100, illustrated, Raleigh, N. C., Oct. 15, 1890).

This pamphlet is concerned with fodder plants and the following are figured: *Cynodon dactylon*, *Cynosurus cristatus*, *Festuca elatior*, *F. ovina*, *F. duriuscula*, *F. rubra*, *Sorghum Halapense*, *Alopecurus pratensis*, *Arrhenatherum avenaceum*, *Dactylis glomerata*, *Agrostis vulgaris*, *Poa trivialis*, *P. compressa*, *P. serotina*, *P. pratensis*, *P. arachnifera*. *Lolium perenne*, *L. Italicum*, *Anthoxanthum odoratum*, *Trifolium hybridum*, *T. incarnatum*, *Lespedeza striata*, *Medicago sativa*, *M. maculata*, *Phalaris intermedia*, var. *angustata*, *Bromus unioloides*, *B. inermis*, *Panicum sanguinale*, *P. Texanum*, *Tripsacum dactyloides*, *Setaria Italica* and *Paspalum platycaule*.

Notes on North American Willows, VI. M. S. Bebb. (Bot. Gaz. xvi. 102-108).

Critical notes are given upon fourteen species of the genus *Salix*. These notes are intended as corrections and added information to the *Salices* of California since the publication of the botany of the State in 1880.

Notes on the Flora of the Lake Superior Region, IV. E. J. Hill. (Bot. Gaz. xv. 324-331).

The author notes that the red and blue-colored flowers of the Minnesota region are very generally brighter in their hues than in other neighboring localities where clouds or fogs prevail and that white flowers show a tendency to coloration in a greater or less degree. This is attributed, probably, to the brighter skies that obtain in Minnesota, and hope is expressed that further observations upon the subject may be made.

Oxalis—Some American. W. F. Endicott. (Gard. and For. iv. 162 163).

Orchids—A Few Native. Mrs. Preston Lovell. (Amer. Nat. xxv. 248-251).

Pecan—The. E. G. Lodeman. (Am. Gard. xii. 272-276; illustrated).

Hicoria Pecan in cultivation and wild is described and figured.

Pinus del Doctor. (Gard. Chron. ix. 435, fig. 92).

Figure of the cone of *Pinus patula*, var. *macrocarpa*.

Podopterus Mexicanus—Zur Kenntniss von. U. Darmmar. (Engl. Bot. Jahrb, xiii. 486-491 ; illustrated.)

Ranunculus lacustris, Beck and Tracy—The Propagation of. Chas. A. Davis. (Bot. Gaz xvi. 115-118).

On account of observations tending to prove that this plant is truly perennial—the new plantlets, perhaps often mistaken for seedlings, being developed from the nodes of the old stems.

Rhamnus Purshiana. K. P. S. Boyd. (Am. Gard. xii. 247, illustrated).

Under this caption we have a description of *Rhamnus* and a picture of some liliaceous plant, apparently *Disporum*. Evidently someone has blundered.

Proceedings of the Club.

WEDNESDAY EVENING, APRIL 29TH.

The Vice-President in the chair and 20 persons present.

Miss Elizabeth C. Schettler, Miss Mary Foster and Miss Rachel W. Farrington were elected active members.

Dr. Edouard Regel, of St. Petersburg, Russia, was elected an honorary member.

The committee on the Botanic Garden announced that the

bill establishing the garden in Bronx Park had become a law, receiving the signature of the Governer of the State.

Dr. Emily L. Gregory read the announced paper of the evening, "On Abnormal Development of *Spirogyra* Cells."

A number of plants sent by Dr. Newberry from Hot Springs, North Carolina, were shown, among them the rare *Disporum maculatum*.

Dr. Britton remarked on the nomenclature of the North American genera of Papaveraceæ, stating that the question of accepting *Diclytra*, Borckh., or *Dicentra*, Bernh., could best be solved by using neither, but by taking up instead *Bikukulla*, Adans., which has priority over either one; likewise, *Capnoides*, Adans., has long priority over *Corydalis*, D.C., and is pretty sure to be restored sooner or later.

TUESDAY EVENING, MAY 12TH.

The President in the chair and 22 persons present.

The following announced papers were read, illustrated by specimens and diagrams: (1) Additions to the flora of Richmond County, N. Y., and (2) Notes on the July flora of Montauk, Long Island, by Arthur Hollick; (3), Notes on the genus *Lespedeza*, by N. L. Britton.

Mr. Lighthipe exhibited cypress knees from Florida, remarking on the lightness of the wood, and stating that from his observations these structures aided the tree in maintaining an erect position in swampy land. He also showed *Castillæa coccinea* from a new station near Rahway, N. J.

The President made the following announcement:

Two prizes, one of $15.00, and one of $10.00, for the best collections of herbarium specimens of flowering plants, exclusive of grasses and sedges, made within 100 miles of New York, during the year 1891. The collections to be made with especial reference to the perfection of the pressed flowers, those of maximum size to be selected in all cases. Fruit to be supplied if possible, and so far as practicable in woody plants from the same shrub or tree furnishing the flowers. The specimens to be named, and the maximum size of flowers and fruit observed to be stated on the labels, dimensions to be given in lines and inches.

The collections to be submitted to the committee on Phanerogamia of the Local Flora for adjudication by November 1st, 1891. No collection of less than 300 species will be received.

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